SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
The Power To Do More.℠
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June 9, 2006

Commissioner John Geesman
Commissioner Jackalyne Pfannenstiel
California State Energy Resources Conservation and Development Commission
1516 Ninth Street
Sacramento, CA 95814-5512

SUBJECT: DOCKET NO. 06-NSHP-1

Commissioners Geesman and Pfannenstiel:

In accordance with Docket No. 06-NSHP-1, the Sacramento Municipal Utility District (SMUD) submits the following responses to the June 12, 2006 Workshop Attachment A regarding the New Solar Homes Partnership (NSHP). The following are organized by subject in the same order as the June 12, 2006 Workshop Attachment A.

The Sacramento Municipal Utility District (SMUD) has provided national and international leadership in photovoltaics (PV) since 1984. Over 10 MW_{ac} of PV is currently connected to the SMUD grid in the residential, commercial, and utility-owned market sectors. To our knowledge, SMUD is the only electric utility in the state and nation with an active new home solar program. Since 2000, SMUD has sponsored a new home solar program. In 2000, SMUD inaugurated the SMUD Solar Advantage Home program. Between its inception and the suspension of the program in 2003, nine production builders have built 120 solar equipped new homes. A key component of the SMUD Solar Advantage Home program was the requirement that builders had to meet SMUD's Tier III Advantage Home efficiency requirements, which required that the home reduce its Title-24 cooling energy requirements by at least 50%. In 2003, SMUD partnered with the Department of Energy's (DOE) Zero Energy Home/Building America (BA) program. SMUD expanded on that partnership by entering a Cooperative Research and Development Agreement (CRADA) with the National Renewable Energy Laboratory (NREL), DOE's BA program administrator, to design "zero-peak" homes based on local climate zone and production home market conditions. To date, three builders have participated in SMUD's Zero Energy Home (ZEH) Demonstration program, building 111 ZEHs with an additional 28 ZEHs under construction. SMUD is currently negotiating with several builders on single-family, apartment, townhouse/condo and multi-use ZEH projects representing 600 units. Furthermore, SMUD is engaged in transitioning its ZEH Demonstration program into a standard offering under the District's Advantage Home program.

In addition to our program experience, SMUD has conducted several new home PV research activities. Since 2000, we have collaborated with the major PV manufacturers in the development of their Roof-Integrated PV (RIPV) products, including Astropower/GE Energy,

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Powerlight, BP Solar, Unisolar, and Sharp. Currently we operate a demonstration facility at our Hedge PV facility where BP Solar, Unisolar, Powerlight, and Sharp RIPV products have been developed, evaluated and monitored. Our Advanced, Renewable, & Distributed Generation Technologies Program (AR&DGT) recently completed 17 California Energy Commission (CEC) Research, Development Demonstration & Deployment (RDD&D) renewable energy projects; 14 of these projects are photovoltaic. AR&DGT currently has 3 different on-going photovoltaic RDD&D projects. The finished Regen projects have final reports, currently in the process of being approved by the CEC.

We support the Commission's efforts to implement the NHSP and offer our program and research experience as an implementation guide. We believe we bring a unique perspective to these proceedings and hope our comments will help the NSHP activities.

Sincerely,

Michael Keesee
Energy Specialist III

Encl.

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SMUD COMMENTS ON CEC Docket No. 06-NSHP-1
June 9, 2006

I. Eligible Participants

SMUD believes that either builders and/or their assignees should be eligible to receive incentives under the NSHP. Since the inception of the SMUD Advantage Home in 1993, SMUD has directed its new construction incentives to builders and/or its assignees. Our program experience has shown us that providing builders and/or their assignees new construction incentives is the most effective use of incentive dollars.

II. Eligible Systems Specifications

A. NHSP Energy Efficiency Requirements

SMUD believes that the Building America (BA) energy efficiency requirements should be used as the minimum energy efficiency level required to receive incentives under the NHSP. We understand that BA program energy reduction target is a 40% reduction in energy use relative to the BA Benchmark, which is based on a national standard. Currently, SMUD targets a *40% reduction in overall Title-24 energy use (*combined heating, cooling, and water heater energy use). Program experience to date indicates that this is an achievable goal for single-family units built under the current 2005 Title-24 standards using existing, off-the shelf, and commercially available efficiency features. In fact, the model homes in the Treasure Homes Fallen Leaf ZEH project are estimated to achieve between 38% and 43% reductions in overall Title-24 energy use.[1]

We believe that a 40% reduction target in overall Title-24 energy use is important for two important reasons. First, there is a limited amount of incentives available under the NSHP. It is critical that these funds be put to their best use in encouraging not only the adoption of solar by the new home market but in transforming the new home market into a market where ZEH is the norm. Second and perhaps most important research being performed for SMUD by NREL indicates that the combination of high efficiency homes and solar PV provides the most cost-effective peak reduction. In its study prepared for SMUD, NREL found:

> "…by maximizing the investment in energy efficiency options before making investments in advanced options like PV, the size and, therefore, the cost of the investment in the

[1] Achieving 40% reductions in overall Title-24 energy use may be more difficult in new multi-family or attached housing designs. However, we believe that the 40% reduction in energy use target should apply to new multi-family and attached housing as well.

advanced option is minimized. A 4-kWpDC array at a cost of $30,000 would be required for peak cooling demand if no additional investments in energy efficiency beyond Title 24 were made. Not only would a PV-only approach cost more than the optimum found using the BEopt analysis method ($30,000 vs. $25,000), it would also provide significantly lower aggregate peak and off-peak energy savings than the integrated energy efficiency and renewable-energy approach implemented in BEopt's least cost optimization engine."[2]

B. Certification and Warranty of System Components

SMUD supports certification of system components and strongly recommends the Commission pursue certification of PV systems (combinations of modules, inverters, and BOS components). To this end, SMUD supports the efforts of Powermark[3] to develop certification standards for PV modules and potentially other PV components and PV systems. The Commission should participate in system component certification efforts with a goal of establishing standards equivalent to those found in Europe or Japan, such as International Electrotechnical Commission (IEC).

Regarding PV system warranties, homebuilders expect that PV systems will carry the same warranty provisions as existing materials. In addition, building-integrated (BIPV) and roof-integrated PV (RIPV) products will need to carry appropriate UL and Building Code certifications to meet respective standards. For example, to gain universal market acceptance, BI/RIPV products will eventually have to qualify as roofing materials and meet all the standards that roofing materials now meet for fire safety, water tightness, and other building component issues. At a minimum, PV system components will have to reach a 10-year labor and workmanship warranty level to be universally accepted by the new home market.

C. System Size

SMUD believes that PV system size should be optimized to meet a home's peak demand using BA program design criteria. To this end, the BA program 40% energy reduction targets should be used to determine PV system size. We also believe that market conditions and current federal tax credit policies will also work to limit PV size in the production home market. Specifically, production homebuilders are very sensitive to added extra costs to their products, especially in slow real estate markets that are being experienced in many parts of California. Feedback from our builder customers indicates that a 2 kW AC is the optimum size for new home PV system in the Sacramento market (approximately $10,000 in incremental costs after incentive).

[2] "Determining Technology Options and Performance Goals for Future SMUD Residential Energy Programs Using Advanced Energy Efficiency Measure Screening and Evaluation Tools," Draft, 5/25/06, Dr. Ren Anderson, p. 18

[3] SMUD will be joining the Powermark Board of Directors.

III. Geographic Scope

A. Target Markets

To achieve rapid market adoption of solar in the new home market, SMUD recommends that the Commission enter into strategic partnerships with the California Building Industry Association (CBIA) and its regional BIAs. Specifically, we believe that the Commission should work with local BIAs and their builder members to develop subdivision scale demonstration NSHP projects based on the BA program model in specific target markets experiencing high growth and high electric energy use, such as California's inland valley and high desert areas. We also recommend that this effort be undertaken in partnership with DOE's BA program to optimize efficiency and PV system design; leverage existing resources; capitalize on BA's extensive work and outreach with the National Association of Home Builders (NAHB), local BIAs, and California production builders to date; and to avoid duplication of efforts and confusion among builders over what they might perceive to be competing (and/or conflicting) programs. This effort should also be coordinated with the Commission's Public Interest Energy Research (PIER) Zero Energy New Homes (ZENH) efforts. NSHP homebuilder training and homebuyer marketing efforts can be also be concentrated in critical markets to encourage market demand for new solar homes.

B. Encouraging Publicly Owned Utility (POU) Participation in the NSHP

The Commission can take several steps to encourage POU participation in the NSHP. First, the Commission could support and become an active participant in the Municipal PV Utility Working Group (Muni PV Group). The Muni PV Group was organized and is supported by SMUD to provide a forum where POU renewable energy program managers can share program and technical information and discuss issues of common concern. The Group has been meeting on a quarterly basis for three years. During that time, the Group has invited Commissioners and staff to address the group but there has been no permanent Commission representation in or support of the Group.

Second, the Commission can engage existing POU organizations, including CMUA, NCPA, and SCAPPA on NSHP activities, such as cosponsoring workshops, technical trainining, etc. The Commission should also work with WAPA.

Third, the Commission can work with local POUs to co-sponsor local building officials (plan checkers, building inspectors, planners, planning commissions, etc.) training on solar issues, such as PV system inspection, Plan Checking, PV design, etc.

IV. Procedures

A. PV Performance Calculations

The Commission can assist builders in several ways. First, the Commission can sponsor PV system workshops that address key concerns, including:

- Bidding and specifying PV systems;
- How to evaluate PV proposals and select PV suppliers and installers;
- Subcontractor training on PV design and installation issues, especially for roofers and electricians;
- Design guidelines that provide rules of thumb on PV system requirements, such as PV array location, conduit sizing and location, junction box location, area requirements for inverters, disconnect requirements and locations, etc. This is of particular importance in multi-family and attached housing projects where there is limit space for PV Balance of System components, such as disconnects, and potentially long wire runs between PV arrays, inverters, disconnects and meters;
- Utility interconnection and net metering requirements.

B. Third Party Verification

SMUD believes that third-party verification of PV installations would be very effective in ensuring high-performing, reliable PV installations. Unfortunately, we are unaware of any existing, viable third-party verification infrastructure in place to perform such inspections. In lieu of a viable third-party PV system verification industry, the Commission could require all PV systems installed under the NSHP to be commissioned and a copy of the commissioning report to accompany each incentive application. The Commission could then randomly spot check installations to ensure that the PV system was properly installed and operating. Under SMUD's PV Pioneer programs and existing solar programs, SMUD staff inspected PV systems sold and installed by SMUD contractors and currently conducts post installation inspections of commercial and residential retrofit PV systems that use SMUD incentives. [4] Furthermore, SMUD requires contractors participating in SMUD's solar programs to provide PV System Certifications (see attachment 1) that documents the installation and which can be used as basecase in diagnosing and troubleshooting potential system problems.

C. PV System Monitoring

Ideally, all PV systems would come with a low-cost, web-based system that would automatically alert the customer (and installer) that a problem exists with the system. We are unaware of any such system but believe that the market, most likely the inverter manufacturers, will provide such a service in the near term, and SMUD encourages the Commission to support research and development of such a system.

[4] SMUD PV incentives are adjusted based on observed in-field installations. To date, SMUD PV incentives have been reduced an average 5.2% based on these post installation inspections.

In the mean time, SMUD relies on a second "PV Meter" to track PV system performance and alert customers of potential PV system problems. The PV Meter tracks PV kWh production that is recorded on the customer's monthly electric bill. To our knowledge, SMUD is unique in requiring a PV Meter as part of SMUD's solar programs and in providing this information to our customers. Using PV Meters could provide an acceptable solution until an automatic low-cost, web based system is developed by the solar industry. However, use of the PV Meter has several drawbacks even as it provides the customer a low-cost monitoring system. First, unless the PV system completely fails most homeowners don't pay that much attention to their PV system, which can result in slow response to PV system problems. Second, maintaining the PV Meter system is costly and could prove prohibitive if solar is adopted enmass by the local market.

V. Procedures

A. Incentive Reservation Term

Based on our program experience, SMUD believes NHSP incentive reservations should cover the life of the project, or three (3) years. Builders need assurances that an incentive program will cover the life of their project. A typical new home project covers a three-year project, although market conditions can increase or shorten this term.

B. First-Come, First-Serve

In general, SMUD operates its programs on a first-come, first-serve basis, but given that the NSHP is a statewide program the Commission may want to consider reserving funding so that at least a minimum number of projects can occur in each of the state's climate zones. In this regard, our earlier recommendation that the Commission work with local BIAs on showcase demonstration projects in high growth and high electric energy use areas, especially as the NHSP rolls out, would be critical.

C. Outside Agent Administrator

We are neutral on this whether an outside agent should administer the NSHP. However, utilities have built strong relations with their builder customers and generally are better positioned to work with those customers than other parties.

D. Web Site NHSP Information

We strongly recommend that NHSP information, such as PV system cost and production information, be posted on a Commission web site. Access to up-to-date, reliable cost and production information will be critical to growing a competitive solar industry, especially in the

absence of this information in the current market. SMUD plans to use Clean Power Research's Powerclerk to perform this function for our customers.

E. Measuring Program Success

SMUD believes that program success should be measured using market transformation indicators, such as number of builders participating in the program, number of installing contractors, or homebuyer preference surveys, rather than relying solely on NHSP incentive dollars spent or MW of solar installed.

VI. Incentive Structure

A. Incentives for PV as Standard vs. Optional Feature

Given that the NHSP has limited funds, we strongly recommend that NHSP incentives be reserved solely for subdivision scale projects in which solar is offered as a standard feature. Our program experience has demonstrated that solar is most successful when it is offered as a standard feature in a new community. There are several factors working against offering solar as optional feature, including buyer confusion about PV economics; buyer preferences for other optional features, such as flooring, window covering, and cabinetry; lack of qualified and interested builder sale staff; etc. Moreover, market research to date indicates that homebuyers expect the builder to do the due diligence and research necessary in selecting the appropriate solar product to fit their new home product. Furthermore, the NHSP should work with builders who want to be market leaders. Deploying solar, as a standard feature on a subdivision scale will help builders differentiate their product in a competitive market place and help to reward early adapters by providing them a competitive advantage against other builders.

B. PBI Factors

We're confused by this question because by its very nature a PBI provides the appropriate price signals that maximize PV system performance. The diffuculty is in developing a PBI that would create enough market demand to induce homebuilders to provide PV on their new home products. We are unaware of any utility new home construction program that provides homebuyers an incentive to purchase an energy efficient home, and are doubt that such an approach will be effective. In brief, homebuilders simply don't response to such programs. In effect, a PBI is an incentive offered to a homebuyer.

C. Affordable Housing

SMUD supports providing affordable housing a higher NHSP incentive and has adopted the current Emerging Renewable Program 25% "adder" for its Zero Energy Home Demonstration program. We do not believe that there should be different incentives for customer or production homes. However, to maximize the market impact of the limited NHSP, SMUD believes that preference be given to production builders willing to build subdivision scale projects meeting the BA program guidelines. Similar guidelines should be developed for Affordable Housing projects.

VIII. Builder and Market Support Activities

A. Builder and Market Support Activities

Builder support activities will be critical to the success of the NSHP. Under SMUD's ZEH Demonstration program, builders are offered free technical and design services, including:

- Title-24 and Energy efficiency measure analysis and costing;
- PV system design, specification, bid, and proposal review;
- Trade coordination;
- Interconnection support; and
- Sales agent training.

Builders participating in the SMUD ZEH Demo program are enthusiastic about the marketing support provided by SMUD for their ZEH projects. We strongly recommend that the Commission develop similar programs under the NHSP. Currently, SMUD provides builders participating in the ZEH Demonstration program cash incentives to market their ZEH project. The level of marketing support is dependent on the size of the project and is scaled appropriately. SMUD does not dictate the form of the support, but works with the builder and their marketing team to determine what activities work best for the builder and the project. In return for cash incentives SMUD also has copy review rights over all marketing materials. Builders are reimbursed for ZEH project marketing and sales promotion activities based on actual costs.

SMUD also believes that a comprehensive buyer education and awareness program is essential for NHSP success. A NSHP homebuyer education and awareness program should concentrate on sales channels used to reach potential homebuyers, such as web sites and advertising in local newspaper new home real estate sections and new home buyer guides. Any education and awareness program should be tailored for regional new home markets and utilize new home marketing specialists in developing promotional messages.

We recommend that 10 to 15% of the total NHSP budget be developed to builder and marketing support activities.

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ATTACHMENT 1: SMUD SOLAR SYSTEM CERTIFICATION